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NEW SPECIES OF EREMOBATIDAE (ARACHNIDA, SOLIFUGAE) FROM NORTH AMERICA

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ABSTRACT. Five new species of Solifugae are described from North America: *Eremobates chihuaensis*, *Eremobates gerbae*, *Hemerotrecha sevilleta*, *Hemerotrecha cornuta*, *Eremochelis oregonensis* as well as the females of *Eremocosta gigasella* (Muma, 1970), and *Eremobates polhemusi* Muma & Brookhart, 1988.

Keywords: Taxonomy, solpugida, camel spiders, sun spiders, wind scorpions

The solifuges of North America are among the best known in the world due to the extensive publications of the late Martin Muma. The last major taxonomic publications dealing with North American solifuges (Muma 1987, 1989; Muma & Brookhart 1988) raised the number of named taxa in U.S.A. and Canada to 175 species in 10 genera, of which four genera belong to the Ammotrechidae (*Ammotrecha* Banks, *Ammotrechella* Roewer, *Ammotrechula* Roewer and *Branchia* Muma) and seven belong to the Eremobatidae (*Eremobates* Banks, *Eremocosta* Roewer, *Eremorhax* Roewer, *Horribates* Muma, *Chanbria* Muma, *Eremochelis* Roewer, *Eremothera* Muma, and *Hemerotrecha* Banks).

Despite this impressive tally, new species are constantly being discovered, and our examination of material from Sevilleta Long Term Ecological Research Site (LTER), Socorro County, New Mexico, along with material collected by the authors and material sent for inspection from various institutions has identified five new eremobatid species and the first females of *Eremobates polhemusi* Muma & Brookhart 1988 which had been described from a single male, and *Eremocosta gigasella* Muma 1970 which had been described from several males collected in Texas and Mexico. Descriptions of these species are presented below.

METHODS

Measurements were made using the methods described by Muma (1951, 1962 & 1970) and Brookhart & Muma (1981). Microscopic measurements were made at 25x using a Bausch and Lomb Stereozoom 7 binocular microscope. A glass slide was lightly pressed across the structures of smaller specimens in order to impose a level plane of measurement. This was particularly useful in measurements of the propeltidium and the female genital operculum. Gross measurements using a plastic ruler were made to the nearest 0.5 mm. Measurements using the ocular micrometer were made to the nearest 0.1 mm. Drawings were made using a camera lucida mounted to an Olympus S7H binocular microscope. Measurements given in the description are in millimeters. Paratype measurements are given as ranges where appropriate. Ratios listed below were used as described in Muma (1951), Brookhart & Muma (1981), and Muma & Brookhart (1988). Diagrams illustrating the method of measurement can be found in Muma & Brookhart (1988). Additionally we used the ratio of chelicera width to width of fixed finger in those species in which the fondal notch was absent or obscure.

Abbreviations: PT = principal tooth; AT = anterior tooth; MT = medial tooth; IT = intermediate tooth; MST = mesal tooth; PL = propeltidium length; PW = propeltidium width: CL = chelicera length; CW = chelicera width; FFW = fixed finger width; FL = fond length; FW = fond width.

Ratios: A/CP: The sum of the lengths of the palpus, leg I and leg IV divided by the sum of length of the chelicera and propeltidium in-

dicating length of legs in relation to body size. The larger the number, the longer legged is the species. FL/FW indicates whether the chelicera fondal notch is longer or wider. Longer is defined as the anterior to posterior axis and width is defined as the dorsal to ventral axis. FW/FFW diagnoses the size of fondal notch compared to the thickness of fixed finger. CW/FFW is used to indicate whether the fixed chelicera finger is thin or robust in relation to the size of the chelicera. GOL/GOW demonstrates the relative size of the female genital operculum in terms of length and width.

Acronyms used in this paper are as follows: AMNH = American Museum of Natural History, N. Platnick; BYU = BrighamYoung University, Richard Bauman; CSU = Colorado State University, Boris Kondratieff; DMNH = Denver Museum of Nature and Science, Paula Cushing; UNM = University of New Mexico, Sandy Brantley and Dick Fagerlund; USU = Utah State University, Wilford Hansen.

Family Eremobatidae Kraepelin 1901
Subfamily Eremobatinae Kraepelin 1901
Genus *Eremobates* Banks 1900
***Eremobates gerbae*, new species**
Figs. 1–7

Material examined.—Male holotype, female allotype, 2 ♂ and 1 ♀ paratype collected from wet pitfall traps at Mack Burn Area, Rincon Mountains, Cochise County, Arizona, USA by Peggy Gerba, 14 August–8 October, 1995 (deposited at DMNH).

Etymology.—This species is named for the collector, Peggy Gerba of Tucson, Arizona.

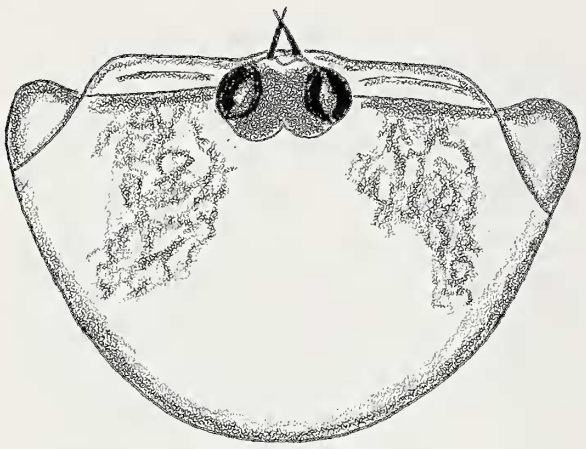
Diagnosis.—*Eremobates gerbae* is placed in the *E. pallipes* group (Muma 1951) based on the shape of the mesal groove of the male fixed finger, the shape of the dorsal aspect of the male fixed finger, and the shape of the female genital operculum. It appears to be closely related to both *E. durangonus* Roewer 1934 and *E. suspectus* Muma 1951. Males of *E. gerbae* are distinguished from both by the presence of palpal papillae which are absent in *E. durangonus* and *E. suspectus*. Male coloration is much lighter than *E. durangonus*. The male fondal notch of *E. gerbae* is wider than its length while *E. suspectus* is longer than wide. The medial notch of the genital operculum in *E. gerbae* is wide, almost equal to its width, and extends approximately two thirds of the medial opercular length as opposed to one fifth in *E. durangonus* and one third in *E. suspectus*.

Description.—*Male holotype:* total length 22, chelicera length 5.1, chelicera width 2.3, propeltidium length 2.4, propeltidium width 3.4, palpus length 16, first leg length 11.5, fourth leg length 22. *Ratios:* A/CP 6.8, CL/CW 2.3, FL/FW 0.6, WFF/FW 0.5, CW/WFF 8.1. *Male paratypes* (2)*:* total length 22.5–25, chelicera length 4.1–5.2, chelicera width 1.7–2.4, propeltidium length 2.1–2.4, propeltidium width 2.7–3.4, palpus length 16–19, first leg 11.4–12, fourth leg 19–23. *Ratios:* A/CP 7.1–7.5, CL/CW 2.0–2.4, FL/FW 0.5–0.7, WFF/FW 0.6–0.7, CW/WFF 6.1–8.6.

Overall color in alcohol dusky yellow. Propeltidium slightly darker than rest of body with brownish-violet blotches anteriorly, eye tubercle dark, abdominal tergites dusky. Palpal tarsi, metatarsi, and anterior edges of propeltidium tinged a faint brownish violet (Figs. 1 & 2), malleoli white. Chelicerae without markings. Fixed finger straight, smooth ventrally, typical of *pallipes* group with a well defined, narrow mesoventral groove extending from tip of chelicera ending in a cup basally beneath the flagellum complex. Movable chelicera finger with larger PT and smaller AT, two distinct IT between PT and AT, the posterior larger and located at the notch of PT and dorsal edge of FF. MST intermediate in size. Fondal notch wider than long with 2–3 small denticles visible mesally. Relative size of fondal teeth graded I, III, II, IV ectally and mesally (Figs. 3 & 4). Flagellum complex typical of *Eremobates* group with apical plumose bristle large, distinct, occupying approximately 75% of mesoventral groove. Palpus with 35–48 small, white, rounded papillae on palpal metatarsus (Fig. 2). No ctenidia on first post-spiracular sternite.

Female allotype: total length 18, chelicera length 5.1, chelicera width 2.1, propeltidium length 3.0, propeltidium width 3.8, palpus length 17, first leg length 12, fourth leg length 18. *Ratios:*A/CP 5.8, GOL/GOW 0.6. *Female paratype:* total length 20, chelicera length 5.2, chelicera width 2.2, propeltidium length 2.9, propeltidum width 3.6, palpus 19, first leg length 12, fourth leg length 16. *Ratios*: A/CP 5.8, GOL/GOW 0.9.

Coloration in alcohol as in the males. Palpus lightly tinged brownish-violet on tarsus and distal end of metatarsus, without palpal



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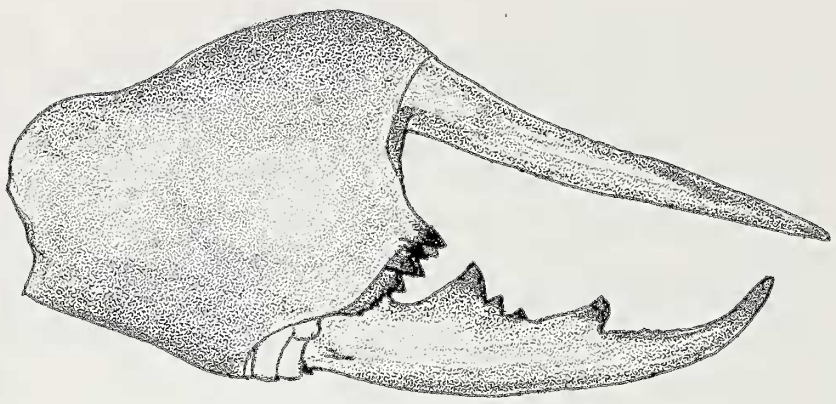

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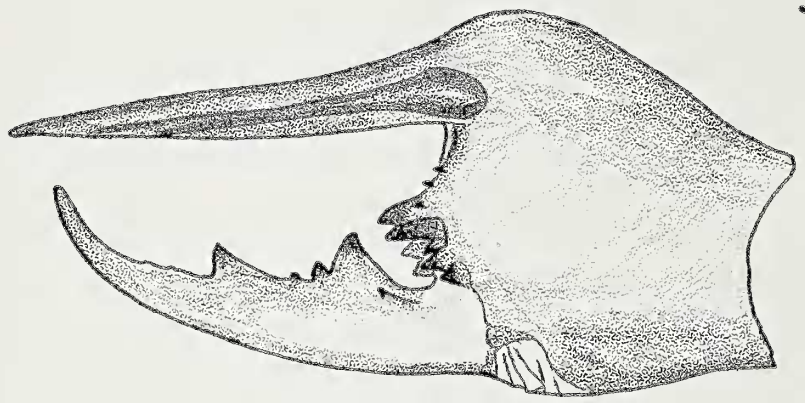

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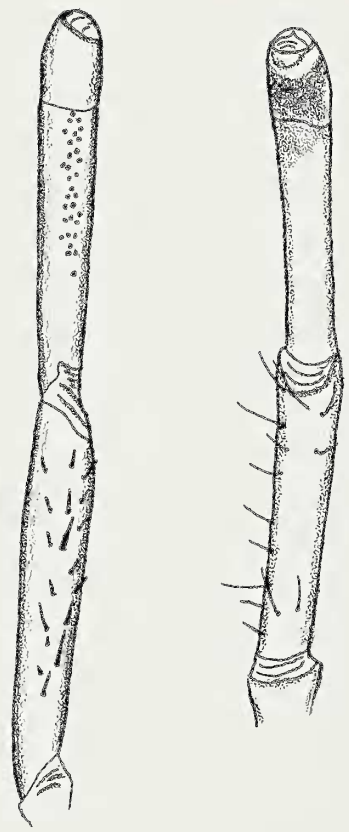

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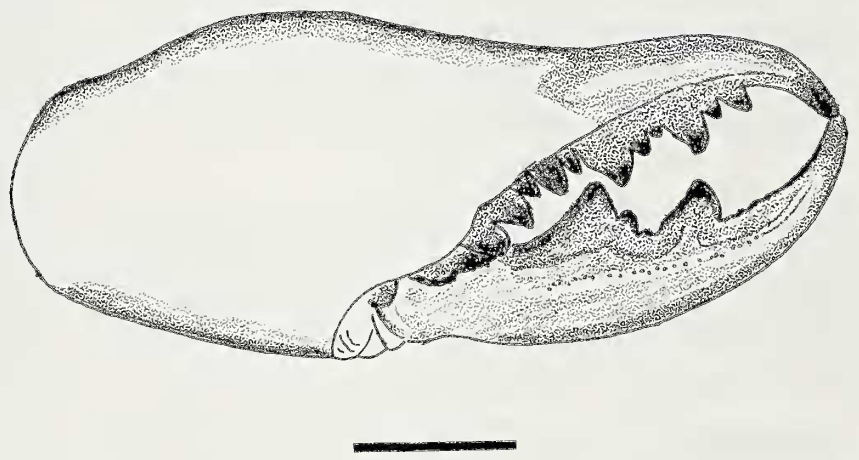

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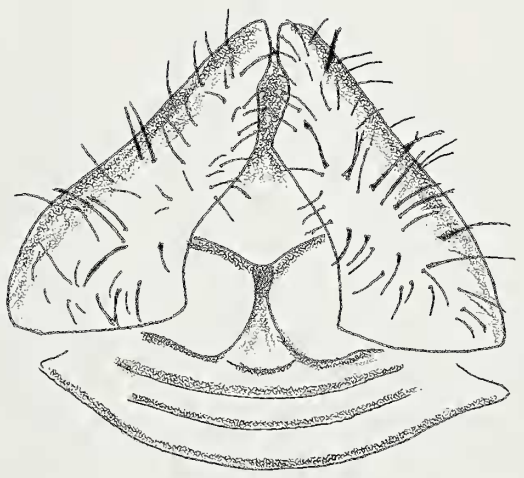

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Figures 1–7.—***Eremobates gerbae*** new species. 1–4. male holotype. 1. Male propeltidium, dorsal view; 2. Male right palpus, mesoventral view; 3. Male right chelicera, ectal view; 4. Male right chelicera, mesal view. 5–7. female allotype. 5. Female right palpus, mesoventral view; 6. Female right chelicera, ectal view; 7. Female genital operculum, ventral view. Scale bar = 1 mm.

papillae or ctenidia (Fig. 5). Fixed chelicera finger with PT and MT large, AT smaller. Two small but defined IT between PT and MT, one IT between MT and AT. Movable chelicera finger with large PT, a slightly smaller AT, 2 distinct IT and a visible MST (Fig. 6). Genital operculum distinctive with two separated, raised scleritized plates, posterior edges straight, interior margin U-shaped for three fourths of its length, anterior arms undulate at the margins (Fig. 7).

Remarks.—Males of *Eremobates gerbae* go to key couplet seven in Brookhart and Muma (1981) which separates *E. durangonus* and *E. suspectus*. The type locality lies somewhat between that of *E. durangonus* which apparently reaches its northern limits in SW New Mexico and *E. suspectus* which is endemic to the White River Basin of Arizona (Brookhart & Muma 1981). *E. gerbae* is known only from type locality.

Eremobates chihuaensis new species
Figs. 8–12

Material examined.—Male holotype and male paratype from 22 miles SE of Chihuahua, Mexico, 25 August 1980 collected by J. B. Karren from the USU collection (both deposited at DMNH).

Etymology.—The specific name is an abbreviation of the type locality.

Diagnosis.—*Eremobates chihuaenis* is placed in the *Eremobates pallipes* group (Muma 1951) based on the shape and position of the mesoventral groove of the male fixed finger and the unmodified dorsal aspect of the fixed finger of the male chelicera. The relatively large posterior tooth located on the PT of the male MF as well as the narrow mesoventral groove distinguishes it from other species of the group. It goes to couplet two in Brookhart & Muma (1981).

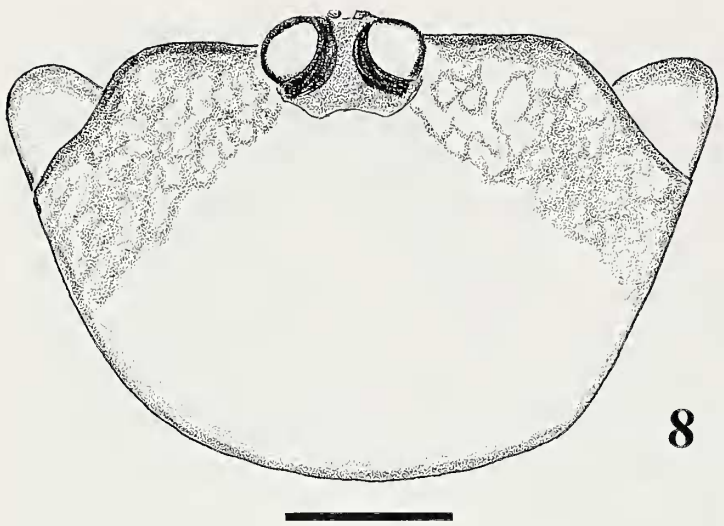
Description.—*Male holotype:* total length 20, chelicera length 6.0, chelicera width 2.8, propeltidium length 3.2, propeltidium width 4.2, palpus length 20, first leg length 15, fourth leg length 20. *Ratios*: A/CP 6.0, CL/CW 2.1, FL/FW 1.7, WFF/FFW 0.83, CW/WFF 4.7. *Male paratype:* total length 23, chelicera length 5.4, chelicera width 2.3, propeltidium length 2.2, propeltidum width 3.7, palpus length 19, first leg length 15, fourth leg length 23. *Ratios*: A/CP 7.5, CL/CW 2.3, FL/FW 1.0, WFF/FW 0.83, CW/WFF 3.6.

Overall color in alcohol dusky yellow, anterior fringes of the propeltidium blotched brownish-violet; abdominal segments darker both ventrally and dorsally. Palpus tinged with blotched brownish-violet markings at the apical end of tarsus (Figs. 8 & 9). Malleoli white. Chelicera typical of members of *pallipes* group with a deep, thin mesoventral groove running from chelicera tip to under origins of flagella complex, widening slightly posteriorly. Fixed finger narrow, smooth, without denticles. Movable finger with large PT, AT smaller, two IT with the posterior larger and on the PT, MST visible but small. Fondal notch V shaped, longer than wide. Fondal teeth graded I, III, II, IV ectally and mesally (Figs. 10 & 11). Flagella complex typical of *pallipes* group with large apical plumose bristle occupying 90% of mesovental groove. Palpus with 50–59 small, white papillae on dorsomesal area of palpal metatarsus, entire palpus with numerous short cylindrical setae interspersed with thin, elongated setae. Two short ctenidia on ventral, fourth abdominal segment, extending less than half the length of the succeeding segment (Fig. 12) . Females are unknown.

Remarks.—Muma (1987) listed four members of the *pallipes* group from Mexico, *E. dinamita* (Roewer 1934), *E. durangonus* (Roewer 1934), both from Durango, Mexico, *E. putnami* (Banks 1898) from Baja California, and *E. formicarius* (C. L. Koch 1842) from Puebla, Mexico. Brookhart & Muma (1981) also postulated that *E. woodruffi* Brookhart & Muma 1981 was at the northern end of its range in the Big Bend region of Texas because of immatures resembling this species found 3 miles south of Renosa, Mexico in the state of Tamalipas. Only *E. woodruffi* occupies an area that might be sympatric with *E. chihuaensis*. *E. woodruffi* differs in coloration and male cheliceral profile from *E. chihuaensis*. Females are unknown for both of the previous two species. The relationship of *E. chihuaensis* to each of these species cannot be clarified until more specimens are collected from Mexico.

Eremobates polhemusi Muma & Brookhart 1988
Figs. 13–16

Eremobates polhemusi Muma & Brookhart, 1988: 18–19, figs. 50–52.



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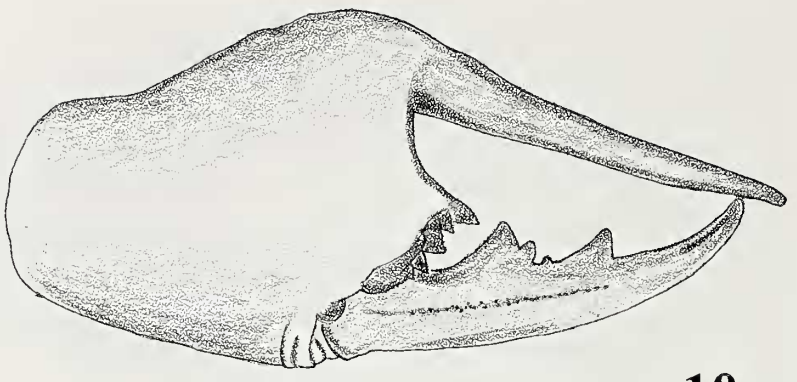

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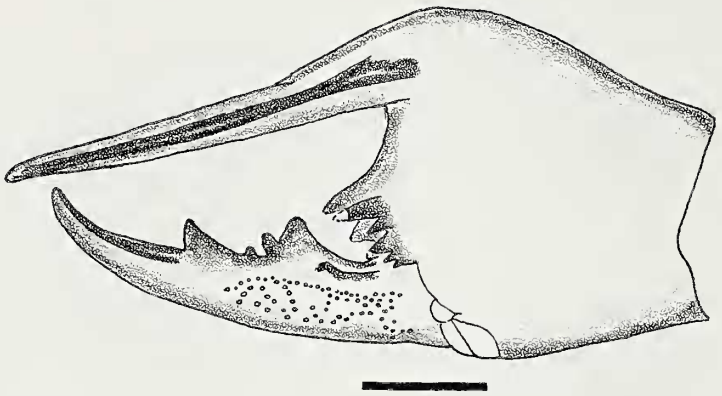

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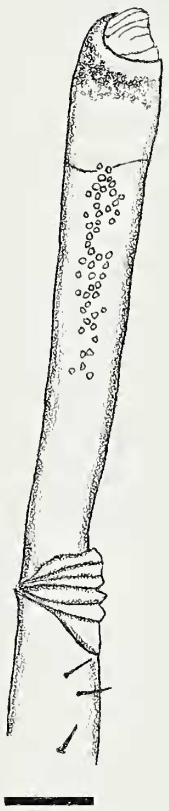

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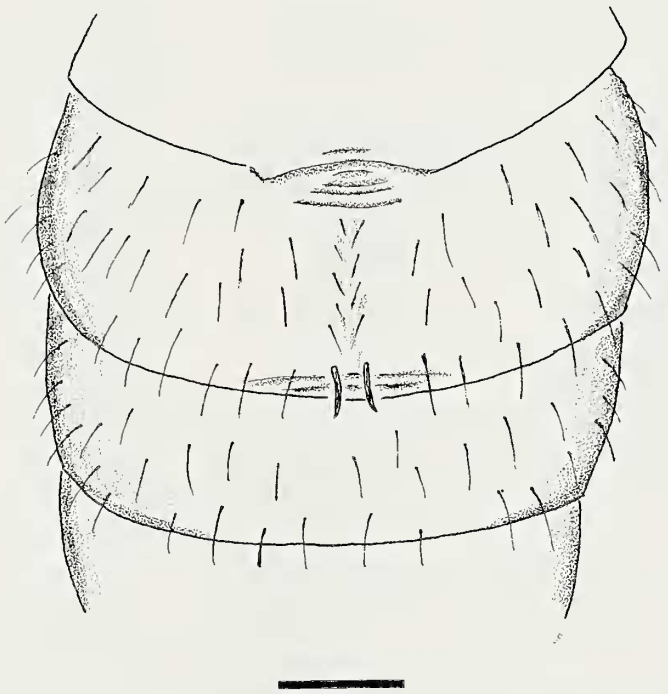

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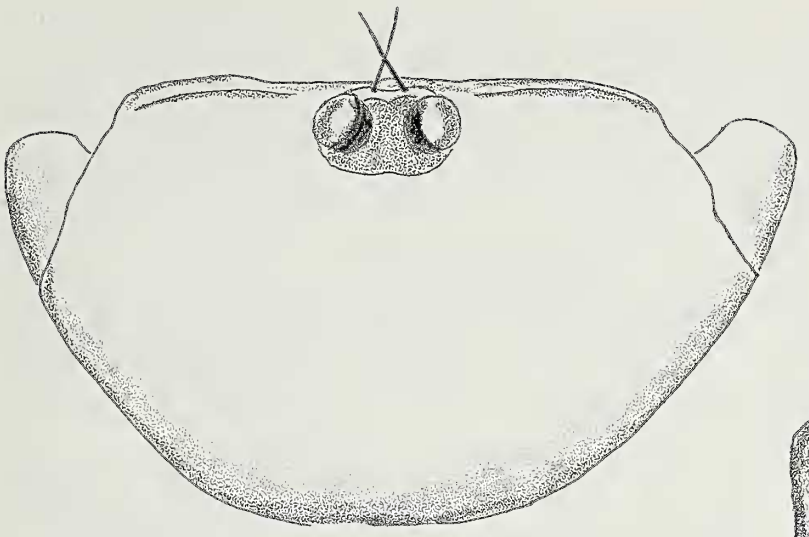
Figures 8–12.—***Eremobates chihuaensis*** new species. 8–12, male holotype. 8. Male propeltidium, dorsal view; 9. Male right palpus, mesoventral view; 10. Male right chelicera, ectal view; 11. Male right chelicera, mesal view; 12. Male fourth abdominal segment showing ctenidia, ventral view. Scale bar = 1 mm.

Material examined.—UNITED STATES: Utah: *San Juan County*: 3♂, 3♀, 4 miles N. of Bluff, collected by Jack and Irene Brookhart in wet can traps set 27 May 2000 and collected 26 August 2000 (deposited at DMNH). No female allotype designated for this species in original description (Muma & Brookhart 1988).

Description.—*Female:* total length 26, chelicera length 7.2, chelicera width 2.9, propeltidium length 2.9, propeltidum width 5.1, palpal length 15, first leg length 14, fourth leg length 23. *Ratios:* A/CP 5.1, GOL/GOW 0.5.

Color in alcohol straw yellow to creamy including the propeltidium (Fig. 13); abdomen slightly darker ventrally and dorsally; palpus and legs straw yellow to dusky yellow. Malleoli white. Palpus covered with numerous cylindrical bristles giving a dusky brown coloration to the apical tip of the tarsus (Fig. 14). Chelicera fixed finger with large PT and MT;



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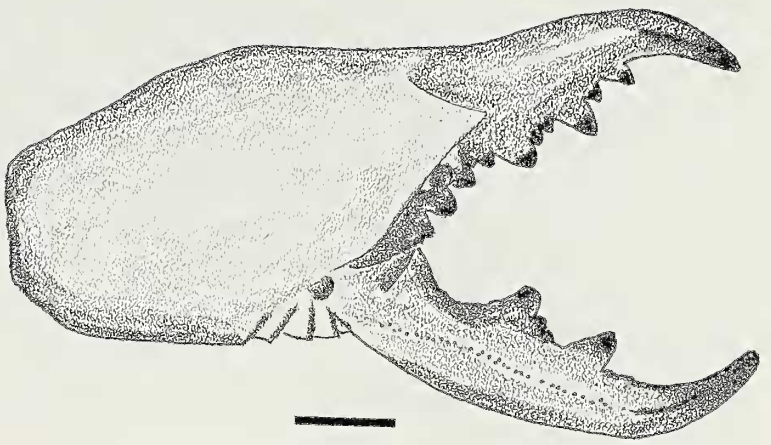

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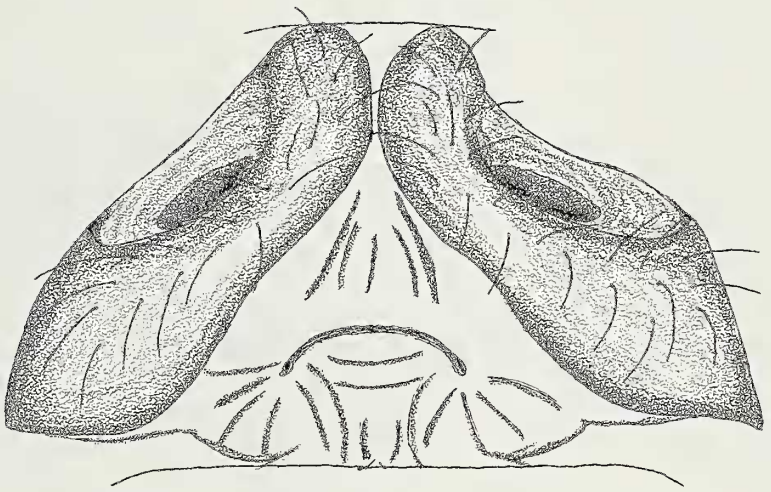

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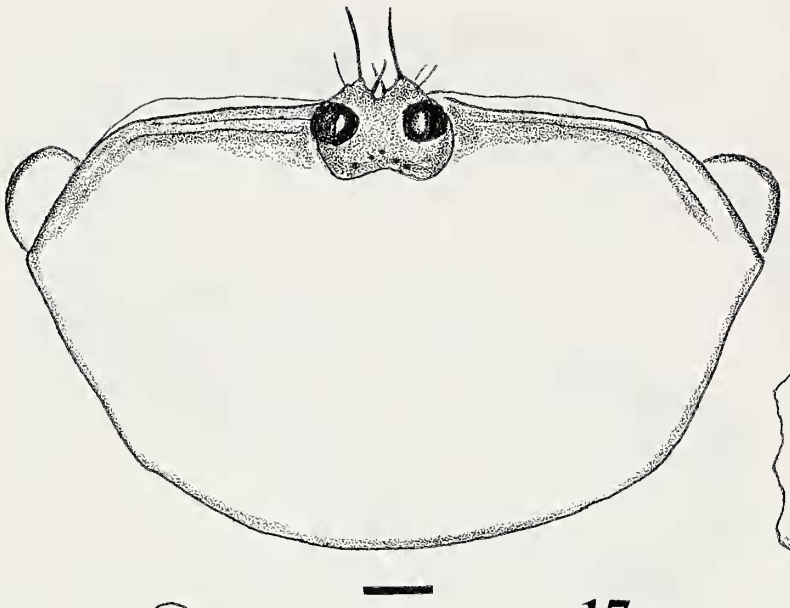
Figures 13–16.—***Eremobates polhemusi*** female. 13. Female propeltidium, dorsal view; 14. Female right palpus, mesoventral view; 15. Female right chelicera, ectal view; 16. Female genital operculum, ventral view. Scale bar = 1 mm.

AT half the size of PT, single, small IT between AT and MT, two small IT between MT and PT, MF with large PT and AT, 2 IT between PT and AT, the posterior situated in the notch of the PT. Fondal teeth graded III, II, I, IV ectally and III, I, II, IV mesally, mesal tooth not visible (Fig. 15). No palpal papillae. No ctenidia. Genital operculum typical of *palpisetulosus* group with two separate raised plates, arms slightly enlarged anteriorly and expanded dorsally. Posterior edges flattened and ending in a point on the exterior surface. Exterior edges curved around a deep opercular pit (Fig. 16).

Remarks.—Muma & Brookhart (1988) identified a single male of *Eremobates polhemusi* from Giddings Trading Post, San Juan County, Utah in their revision of the *Eremobates palpisetulosus* group. The new specimens listed here were from a nearby desert grassland locality. Two other pitfall sites, one in the desert shrub 9 miles north of Bluff, and the other in a piñon-juniper community 14 miles north of Bluff, contained no speci-



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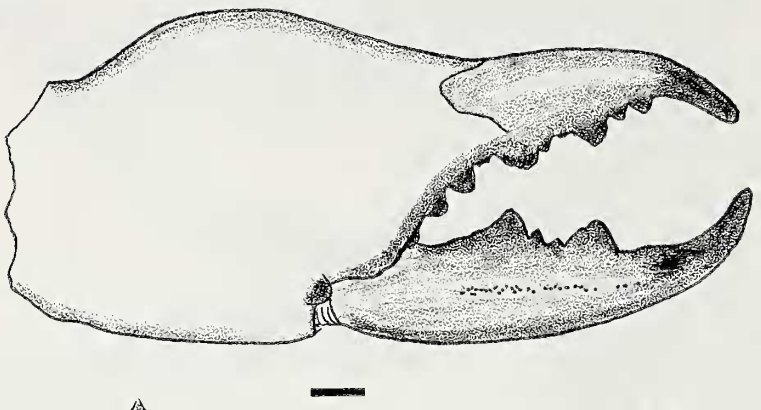

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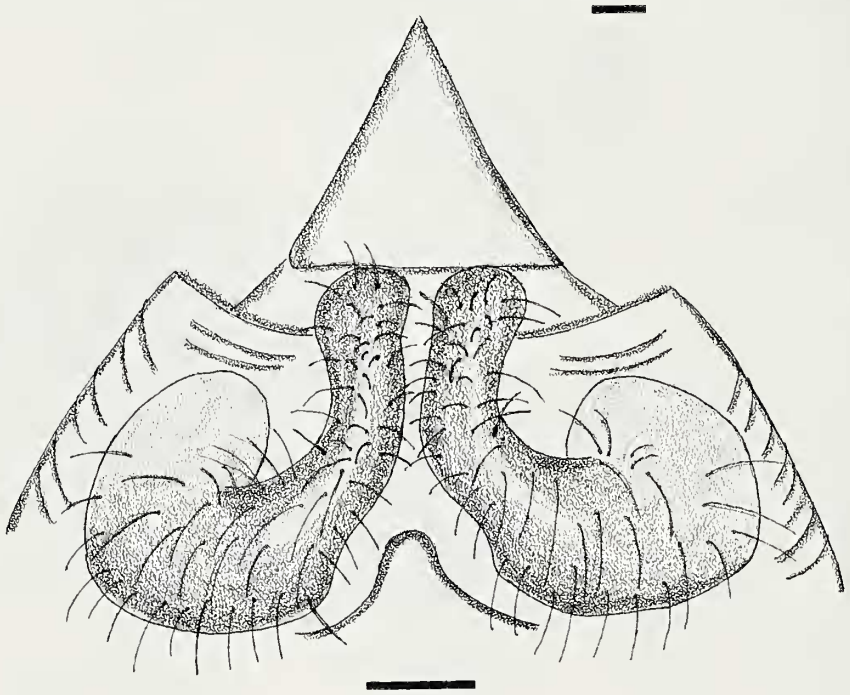

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Figures 17–20.—***Eremocosta gigasella*** female. 17. Female propeltidium, dorsal view; 18. Female right palpus, mesoventral view; 19. Female chelicera, ectal view; 20. Female genital operculum, ventral view. Scale bar = 1 mm.

mens of *E. polhemusi* during the same time span.

Genus *Eremocosta* Roewer 1934

Eremocosta gigasella (Muma)

Figs. 17–20

Eremorhax gigas (Roewer): Muma, 1951: 48, figs 32–33 (misidentification).

Eremorhax gigasellus Muma, 1970: 8.

Eremopus gigasellus (Muma): Muma & Muma, 1988: 11.

Eremocosta gigasella (Muma): Harvey, 2001: in press.

Material examined.—UNITED STATES: New Mexico: *Socorro County*: 1♀, collected in wet can trap, 26 July 1993, Site 222 during survey of Sevilleta LTER (deposited at DMNH).

Diagnosis.—*Eremocosta gigasella* females differ from the related *Eremocosta gigas* (Roewer), a Sonoran species (Muma 1951, 1970) by the position of the IT on the fixed finger which are separated from the PT on *Eremocosta gigasellus* and are located on the PT of *Eremocosta gigas* and by the relative size of the fondal teeth which are graded I, III, II, IV in other members of *Eremocosta* but are graded II, III, I, IV in *E. gigasella*.

Description.—*Female:* total length 26, chelicera length 14.1, chelicera width 6.4, propeltidium length 6.5, propeltidum width 11.0, palpal length 15, first leg length 11.5, fourth leg length 19. *Ratios*: A/CP 2.2, GOL/GOW 0.6.

Coloration of specimen in alcohol straw colored with darker abdominal tergites. Anterior margin of propeltidium dusky (Fig. 17). Malleoli white. Palpi straw colored, with dusky tarsi and apical region of metatarsi (Fig. 18). Dentition of chelicera similar to *Eremocosta striata* (Muma, 1951). Fixed finger with large PT and MT and smaller AT. Two IT between PT and MT and one IT between MT and AT. Movable finger with large PT and AT. Two IT located just anterior to PT. Mesal tooth present. Fondal teeth graded II, III, I, IV ectally and mesally (Fig. 19). Genital operculum as in *E. striata*, (Muma 1951, fig. 31, p. 46), with long raised arms ending posteriorly in a flared flattened inverted funnel like structure. Interior margins undulate. Exterior margins tightly recurved. Posterior margin flattened (Fig. 20).

Remarks.—Muma (1970) renamed some specimens as *Eremorhax gigasellus* that he had previously called *E. gigas* (Roewer 1934), based upon examination of the holotype of *E. gigas*. He designated a male holotype from Boquillas, Texas deposited in AMNH (Muma 1970), and later (Muma 1976) indicated that this species is known only from several males in Texas. A male *Eremocosta gigasella* was also found at the Sevilleta LTER (Brookhart and Brantley 2001). We were unable to find the male from Brewster County, Texas (Muma 1951) which probably represents a specimen of *E. gigasella*. Vázquez (1981) recorded this species from Coahuila and southern Veracruz, Mexico. A female from Chihuahua, Mexico (BYU) also fits this new description. Distribution: Texas, New Mexico, Mexico.

Subfamily Therobatinae Muma 1951
Genus *Hemerotrecha* Banks 1903
Hemerotrecha cornuta new species
Figs. 21–29

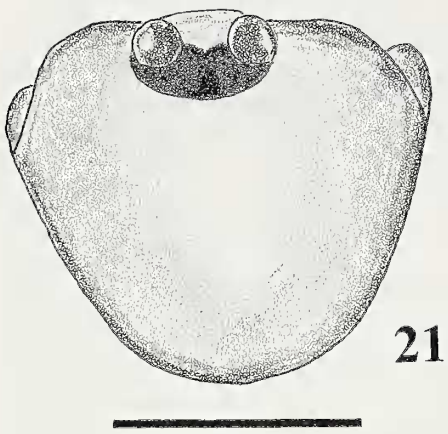
Material examined.—Male holotype, female allotype, 5 ♂ paratypes, and 3 ♀ paratypes collected in wet pitfall traps placed near a gravel wash 6 miles N. of Boone, Colorado, USA, 20 May – 20 June 1976 by Jack Brookhart (deposited at DMNH).

Etymology.—From the latin *cornu* (horn) a description referring to the large horn-like setae on the dorsal surface of the male chelicera.

Diagnosis.—This species is placed in the *Hemerotrecha branchi* group (Muma 1951) based on the structure of the male flagellum complex and the male cheliceral profile which has modified but identifiable teeth on the male fixed finger. Females have the characteristic pear-shaped, raised operculum with a longitudinal rather than transverse genital opening. It appears most closely related to *H. sevilleta*, new species, *H. marathoni* Muma 1962 and *H. milsteadi* Muma 1962 known from Texas (Muma 1962, 1970). It is easily identified by the tiny denticles of the male fixed finger, lack of fondal teeth, slightly flatter, wider, shorter ctenidia, and truncated, notched posterior edge of female genital operculum.

Description.—*Male holotype:* total length 8, chelicera length 2.0, chelicera width 0.87, propeltidium length 1.5, propeltidum width 1.8, palpal length 7, first leg length 5.5, fourth leg length 10. *Ratios:*A/CP 6.4, CL/CW 2.3, CW/WFF 4.7. *Male paratypes* (5) – total length 8–12, chelicera length 2.0–2.27, chelicera width 0.8–1.2, propeltidum length 0.6–1.1, propeltidum width 0.8–1.2, palpal length 7–8, first leg length 5.5–6, fourth leg length 9–11. *Ratios*:A/CP 6.3–7.7, CL/1.7–3.3, CW/WFF 3–4.7. Because there was no fond, the ratios FL/FW and WFF/FW were not calculated.

Color in alcohol dusky yellow except for dusky amber markings on tarsus, metatarsus, and tibia of palpus and anterior edges of propeltidium (Figs. 21 & 22). Propeltidium slightly darker than the rest of body, eye tubercle dark, chelicerae without markings, abdominal tergites dusky. Malleoli white. Fixed finger undulate with a small denticle near apical end. Mesal groove obscure. Movable finger with small PT and slightly larger AT. A small IT anterior to PT and separated by a small notch below PT. No fond visible ectally, fond greatly reduced mesally with two tiny teeth. Flagellum complex typical of *branchi* group with flattened striate setae dorsally, apical plumose bristles distinct except the apical bristle which is strongly hooked and blunt tipped, ventral bristles also strongly plumose. Several horn-like setae on the dorsal aspect of the chelicera (Figs. 23 & 24). Palpus with 19–30 large, white, clavate papillae on palpal



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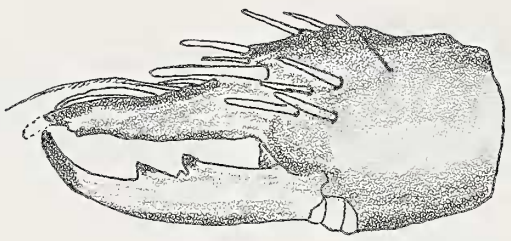

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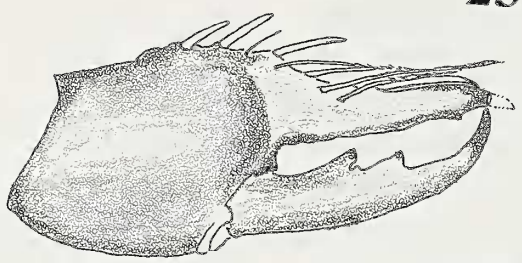

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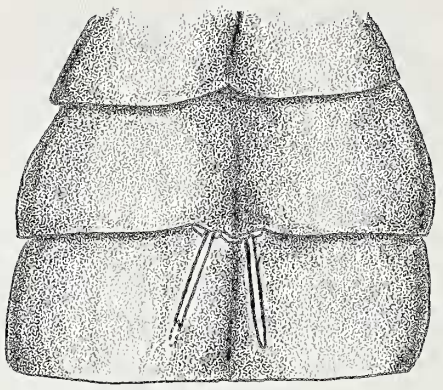

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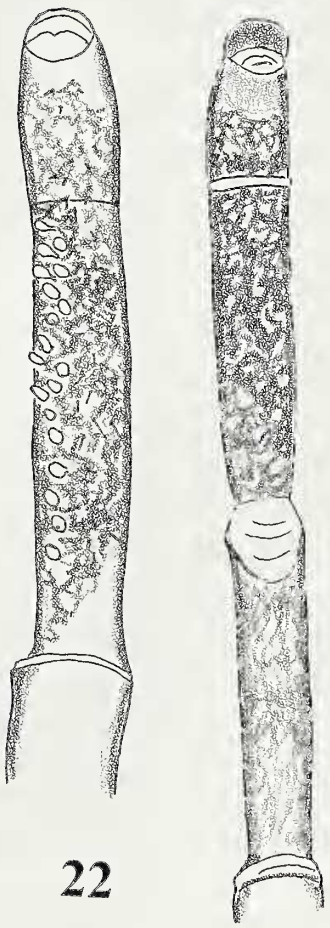

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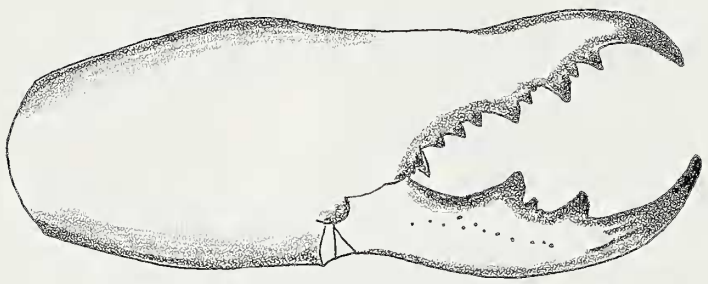

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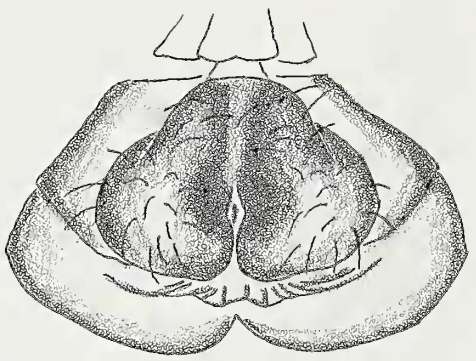

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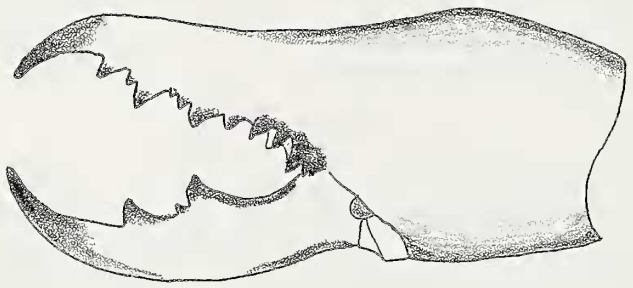

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Figures 21–29.—***Hemerotrecha cornuta*** new species. 21–25, male holotype. 21. Male propeltidium; 22. Male right palpus, mesoventral view; 23. Male left chelicera, ectal view; 24. Male left chelicera, mesal view; 25. Male fourth abdominal segment showing ctenidia, ventral view. 26–29, female allotype. 26. Female right palpus, mesoventral view; 27. Female right chelicera, ectal view; 28. Female right chelicera, mesal view; 29. Female genital operculum, ventral view. Scale bar = 1 mm.

metatarsus (Fig. 22) and several small pointed setae on palpal tarsus and metatarsus. First post-spiracular sternite with two, thin, flat ctenidia extending over less than three-fourths the length of the succeeding tergite (Fig. 25).

Female allotype: total length 10, operculum length 2.8, operculum width 0.9, propeltidium length 1.2, propeltidium width 1.8, palpal length 7, first leg length 4, fourth leg length 9.5. *Ratios:* A/CP 5.2, GOL/GOW 0.7. *Female paratypes,* (4) total length 10–12, operculum length 2.3–2.9, operculum width 0.8–

1.8, propeltidium length 1.5–2.3, propeltidum width 1.7–2.3, palpal length 6–7, first leg length 4.5–5, fourth leg length 9.5–10.5. *Ratios*:A/CP 4.9–5.3, GOL/GOW 0.6–0.7. Color in alcohol the same as the males. Operculum fixed finger with AT, IT and PT, two smaller teeth separate the PT and MT, a single IT separates the MT and AT. Movable finger with large PT and AT and a smaller IT separated from the PT. Fondal teeth I, II, III equal in size with IV somewhat smaller ectally and mesally (Figs. 27 & 28). No papillae and no spine-like setae on the palpus (Fig. 26). Genital operculum typical of the *branchi* group with two joined, raised, rounded, pear-shaped plates surrounding the genital opening. These plates are expanded laterally at the posterior edges, with a slight notch on the truncated posterior margin (Fig. 29).

Remarks.—The entire type series was collected in wet pit fall traps placed in a gravel wash populated with widely spaced salt bush, *Atriplex canescens*. Brookhart (1972) collected in this area but did not record this species in Colorado, probably because he used dry pit fall traps. Brookhart has also collected this species in wet can traps near Peyton Road, El Paso County, Colorado. Brookhart (1972) recorded another member of the *branchi* group, *H. minima* Muma 1951 from Colorado. Muma (1989) suggests that the entire group may need revision.

Hemerotrecha sevilleta new species
Figs. 30–38

Material examined.—Male holotype, female allotype, 4 ♂ paratypes, and 3 ♀ paratypes collected 29 July 1991 at the Sevilleta National Wildlife Reserve, Socorro County, New Mexico, USA, in wet can traps that are part of the Sevilleta LTER, Wild Fire experimental area (deposited at DMNH).

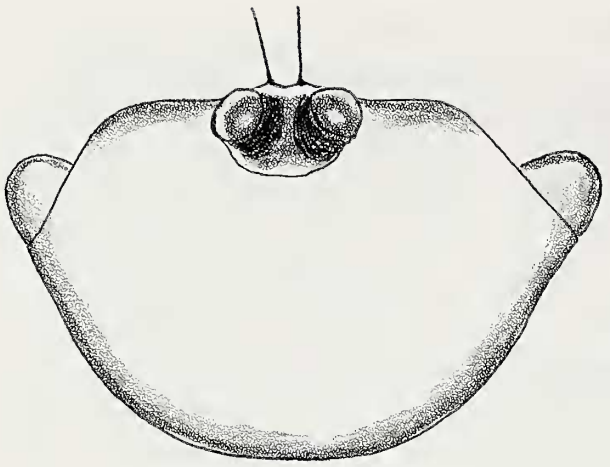
Etymology.—Named for the Sevilleta LTER collection area and to be treated as a noun in apposition.

Diagnosis.—This species is placed in the *Hemerotrecha branchi* group (Muma 1951) based on the structure of the male flagellum complex and the male operculum profile which has modified but identifiable teeth. It can be separated from *H. cornuta* by the size and length of ctenidia, dentition of the male fixed finger, visible fondal tooth, and posteriorly rounded shape of female genital operculum. It appears more closely related to *H. mil-steadi* but can be separated by examining the shape and dentition of the fondal notch.

Description.—*Male holotype:* total length 9, chelicera length 2.5, chelicera width 1.8, propeltidium length 1.1, propeltidium width 1.6, palpal length 7.5, first leg length 6, fourth leg length 10. *Ratios:* A/CP 6.7, CL/CW 3.1, CW/WFF 2.5. *Male paratypes*: (5) total length 8–10, chelicera length 2.1–2.5, chelicera width 1.2–2, propeltidium length 1.3–1.5, propeltidum width 1.3–2.0, palpal length 7.5–8, first leg length 5–6.5, fourth leg length 8–11. *Ratios*: A/CP 5.8–7.3, CL/CW 2.5/2.8, CW/WFF 2.5–3.7. Because there was no visible fond the ratios FL/FW and WFF/FW were not calculated.

Color in alcohol dusky yellow except for dusky markings on tarsus, metatarsus, tibia, and apical 1/3 of femur of palpus and anterior edges of propeltidium (Figs. 30 & 31). Chelicera without markings. Propeltidium slightly darker than rest of body, eye tubercle dark, abdominal tergites dusky. Malleoli white. Fixed finger with two distinct, small, tightly spaced denticles. Movable finger with approximately equal sized PT and AT, tiny IT below notch of PT. Fondal notch obscure ectally and mesally. One, tiny fondal tooth visible ectally, one distinct and one tiny tooth on the fond mesally. Mesal groove not visible. Flagellum complex typical of *branchi* group with flattened striate setae dorsally, apical plumose bristles distinctly plumose except the apical bristle which is strongly hooked and blunt tipped. Ventral bristles strongly plumose. Dorsal surface of chelicerae with several horn-like setae (Figs. 32 & 33). Palpus with 13–25 large white, clavate papillae on palpal metatarsus, palpal tarsus and metatarsus with several small pointed setae (Fig. 31). First post-spiracular sternite with two thin, flat ctenidia extending to or over the margin of the succeeding sternite (Fig. 34).

Female allotype: total length 8.5, chelicera length 2.7, chelicera width 1.1, propeltidium length 1.3, propeltidium width 1.7, palpal length 7, first leg length 5, fourth leg length 8. *Ratios*: A/CP 5.0, GOL/GOW 0.7. *Female paratypes*: (3) total length 8.5–11, chelicera length 2.5–3.3, chelicera width 0.9–1.2, propeltidum length 0.8–1.3, propeltidium width 1.1–2.1, palpal length 6.5–7, first leg length 4–6, fourth leg length 7–11. *Ratios:* A/CP 4.4, GOL/GOW 0.6/0.7. Color in alcohol the same



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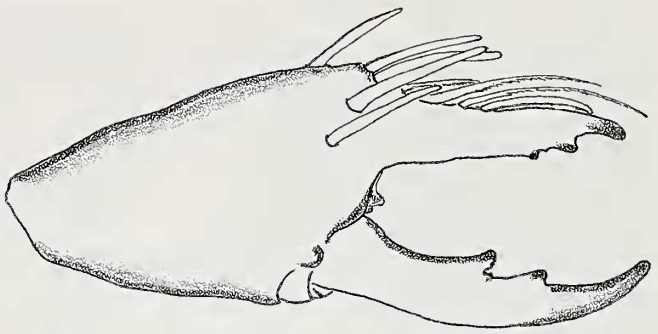

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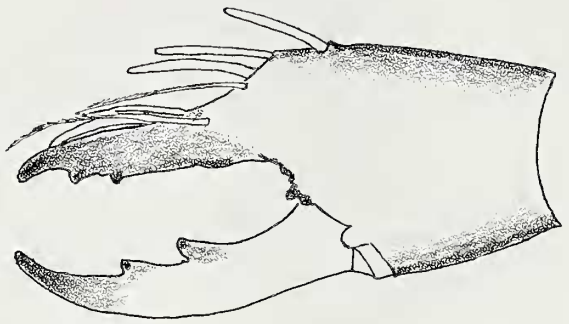

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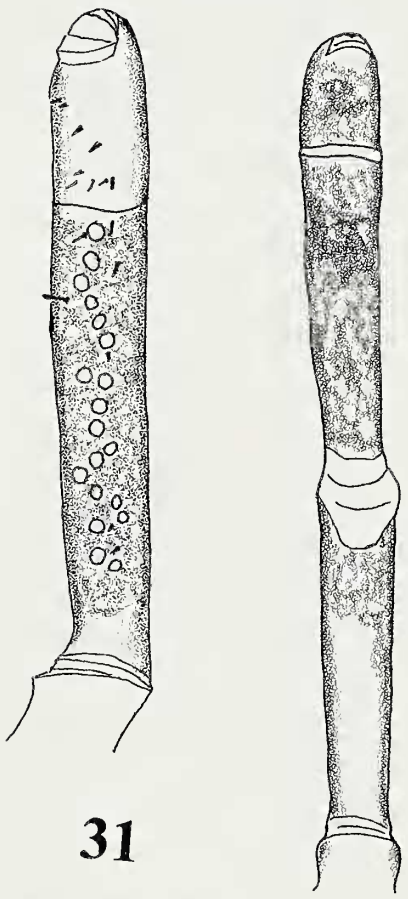

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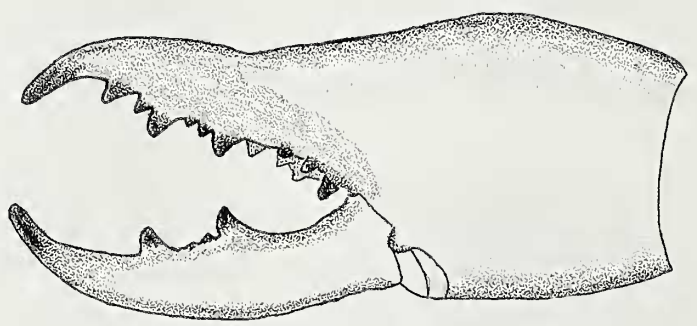

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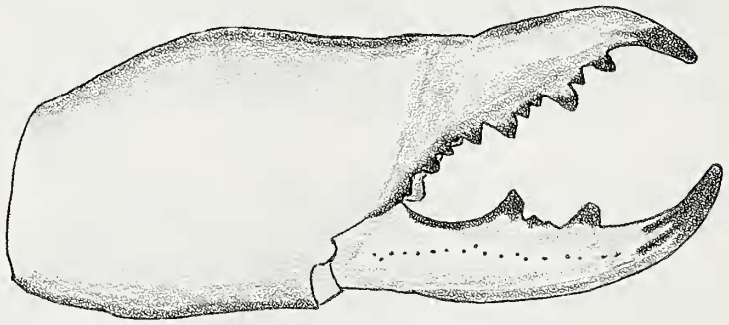

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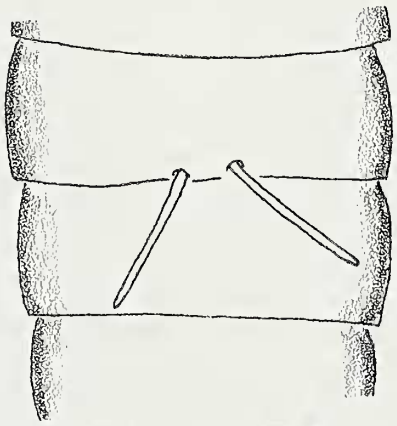

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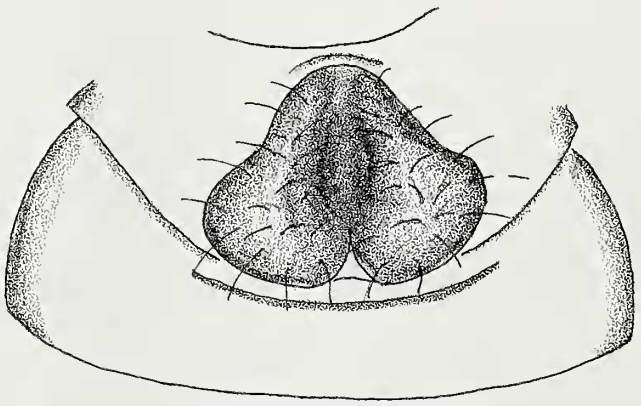

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Figures 30–38.—***Hemerotrecha sevilleta*** new species. 30–34. male holotype. 30. Male propeltidium, dorsal view; 31. Male right palpus, mesoventral view; 32. Male right chelicera, ectal view; 33. Male right chelicera, mesal view; 34. Male fourth abdominal segment showing ctenidia, ventral view. 35–39. female allotype. 35. Female right palpus, mesoventral view; 36. Female right chelicera, mesal view; 37. Female right chelicera, ectal view; 38. Female genital operculum, ventral view. Scale bar = 1 mm.

as the males except for a dusky palpal tarsus (Fig. 35). Operculum fixed finger with PT, MT, and AT, two smaller IT separate the PT and MT, a single IT separates the MT and AT. Movable finger with PT and AT and two tiny IT. Fondal teeth graded I, III, II, IV ectally and mesally (Figs. 36 & 37). No papillae and no spine-like setae on the palpus. Genital operculum typical of the *branchi* group with two rounded, pear-shaped, raised plates, apparently connected anteriorly, surrounding transverse genital opening. Posterior edges rounded without a notch. It resembles both *H. marathoni* and *H. cornuta*, new species (Fig. 38). It differs from *H. cornuta* in the shape of the posterior edge of the genital operculum but cannot be separated from *H. marathoni* in the female.

Remarks.—*Hemerotrecha sevilleta* was collected in four of the six study areas in the Sevilleta LTER Project, Socorro County, New Mexico. It was most commonly found in the site called Goat Draw which was a mixed piñon-juniper community. It was also found in three other LTER study areas: Five Points Larrea, Rio Salada Larrea, and a mixed piñon-juniper/scrub oak site called 222. The first two sites are dominated by creosote bush, *Larrea tridentata*. It was not collected in the two dry grassland study sites (Brookhart & Brantley 2001).

Hemerotrecha sevilleta, *H. milsteadi*, *H. marathoni* and *H. macra* Muma 1962 are all found in areas considered to be part of the northern Chihuahua Desert or the adjacent arid grasslands. Whether they are all variants of the same species or sympatric in this area awaits further investigation.

Genus *Eremochelis* Roewer 1934
Eremochelis oregonensis new species
Figs. 39–43

Material examined.—Male holotype, collected by Opler & Buckman, Valley Falls, Lake County, Oregon, USA, 26 May 1999 (deposited in DMNH).

Etymology.—The specific name is a noun in apposition from the state in which it was collected.

Diagnosis.—*Eremochelis oregonensis* is placed in the *Eremochelis branchi* group (Muma 1951) based on the form of flagella complex which has a flattened apical striate setae and a slightly undulate FF. It keys to couplet three in Muma (1987). Females unknown.

Description.—*Male holotype:* total length 14, chelicera length 3.3, chelicera width 1.3, propeltidum length 1.8, propeltidium width 2.3, palpal length 14, first leg length 7, fourth leg length 16. *Ratios*: A/CP 7.3, CL/CW 2.5, FL/FW 0.7, WFF/FW 1.0, CW/WFF 4.2.

Overall color in alcohol dusky yellow, abdominal tergites darker. Propeltidium dark to dusky with a thin pale oval stripe in middle (Fig. 39). Palpus (Fig. 40) and leg I dusky purple on femur, tibia, metatarsus, and tarsus. Legs II, III, and IV dusky purple on femur, tibia, metatarus and apical half of tarsus. Malleoli white. Fixed finger straight most of the length, curved down slightly at the tip. Ventral edge minutely undulate ending in a shallow trough apically. Mesoventral groove shallow, extending about one half the length of FF on the ventral edge. Movable finger with a single large PT and a small depression anteriorly. No AT or IT. Apical one third with shallow trough on dorsal edge. MST absent. Fondal notch a semicircle rising into the ventral edge of the FF. Fondal teeth graded I, II, III, IV ectally and mesally (Figs. 41 & 42). Flagellum complex typical of *branchi* group with dorsal bristles tubular, medial bristle flattened plumose, ventral series thin, plumose. No papillae on palpal scopae. Two short, thin ctenidia found on posterior margin of 4th abdominal segment (Fig. 43).

Remarks.—The distinctive semi-circular shape of the fondal notch is found in *E. bidepressus* (Muma 1951) of the *branchi* group and in *E. flexacus* (Muma 1963), *E. imperialis* (Muma 1951), and *E. insignitus* (Roewer 1934), all members of the *imperialis* group, suggesting that a revision of both groups might be in order based on this character. *Eremochelis oregonensis* can be distinguished from the closely related *E. bidepressus* by the size of the ctenidia which are short in *E. oregonensis* and long and thin in *E. bidepressus* and the position of the mesal groove. *E. bidepressus* has only been found in Utah.

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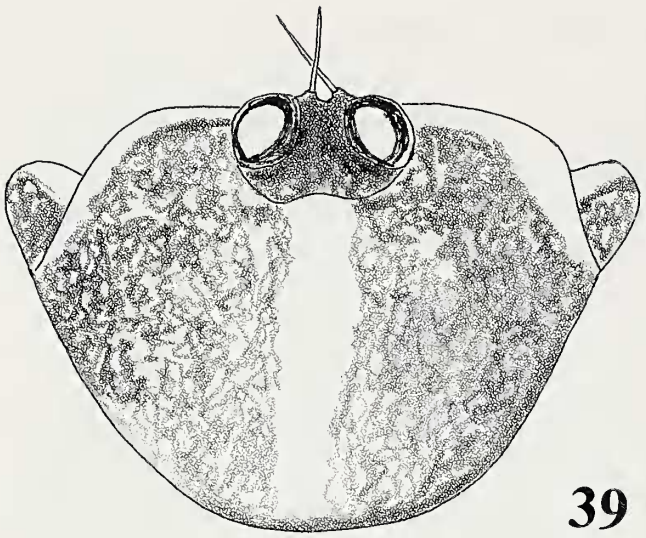

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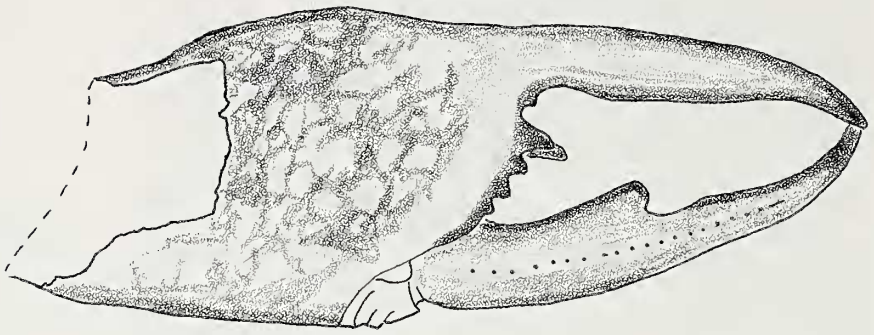

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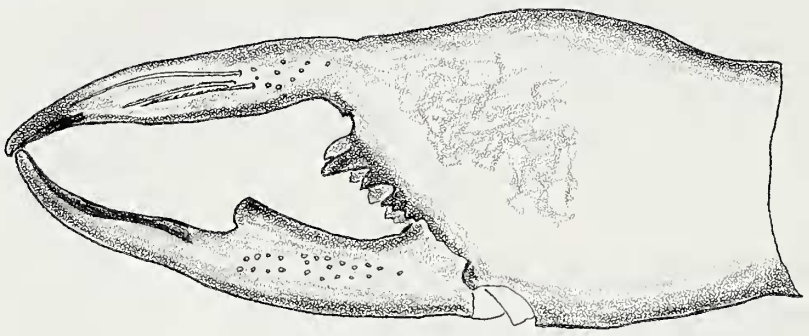

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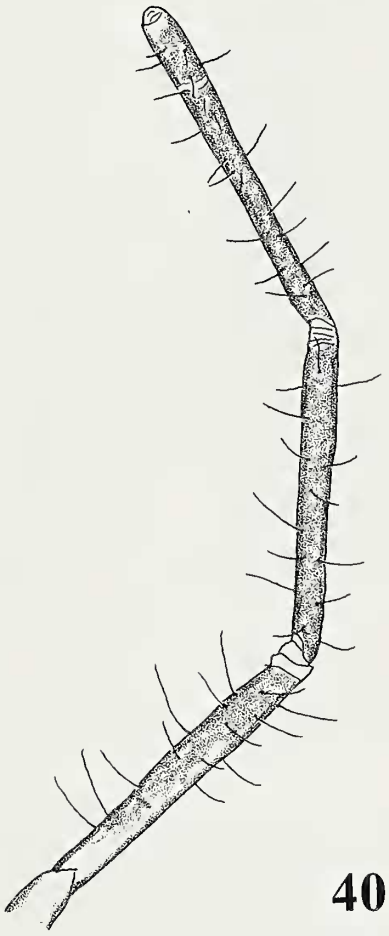

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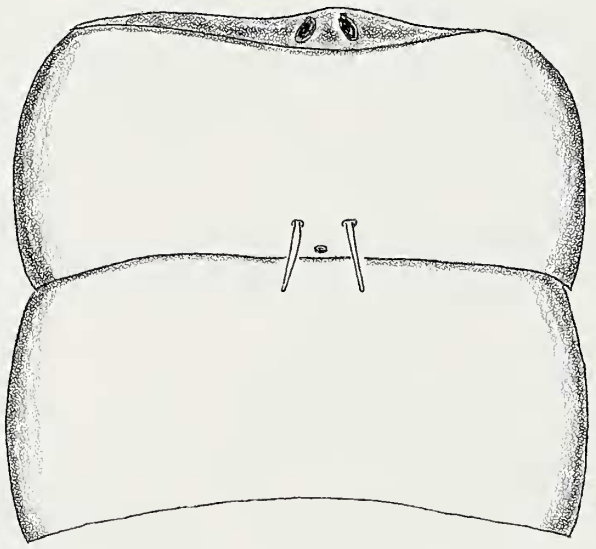

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Figures 39–43.—***Eremochelis oregonensis*** new species, male holotype. 39. Male propeltidium, dorsal view; 40. Male right palpus, mesoventral view; 41. Male right chelicera, ectal view; 42. Male right chelicera, mesal view; 43. Male fourth abdominal segment showing ctenidia, ventral view. Scale bar = 1 mm.

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LITERATURE CITED

Brookhart, J. 1972. Solpugids (Arachnida) in Colorado. Southwestern Naturalist 17:31–34.

Brookhart, J.O. & M.H. Muma. 1981. The *pallipes* species-group of *Eremobates* Banks (Solpugida: Arachnida). Florida Entomologist 64:283–308.

Brookhart, J.O. & S. Brantley. 2001. Solpugids of the Sevilleta LTER. Southwestern Naturalist 45: 443–449.

Harvey, M.S. 2001. Nomenclatural notes on Solifugae, Amblypygi, Uropygi and Araneae (Arachnida). Records of the Western Australian Museum (in press).

Muma, M.H. 1951. The arachnid order Solpugida in the United States. Bulletin of the American Museum of Natural History 97:35–141.

Muma, M.H. 1962. The arachnid order Solpugida in the United States, supplement 1. American Museum Novitates 2092:1–44.

Muma, M.H. 1970. A synoptic review of North American, Central American and West Indian Solpugida (Arthropoda: Arachnida): Arthropods of Florida and Neighboring Land Areas 5:1–62.

Muma, M.H. 1976. A review of Solpugid families (with an annotated list of Western Hemisphere solpugids). Published by the office of Research, Western New Mexico University 2(1):1–31.

Muma, M.H. 1987. New species and records of Solpugida (Arachnida) from Mexico, Central America and the West Indies, pp. 1–24, and 4 plates. Privately published for the author by Southwest Offset, Silver City, New Mexico.

Muma, M.H. 1989. New species and records of Solpugida (Arachnida) from the United States, pp. 1–50 and 8 plates. Privately published for the author by Douglas Print Shop.

Muma, M.H. & J.O. Brookhart. 1988. The *Eremobates palpisetulosus* species-group (Solpugida: Eremobatidae) in the United States. Published for the authors by the Cherry Creek High School print shop.

Muma, M.H. & K.E. Muma. 1988. The arachnid order Solpugida in the United States (Supplement 2, A Biological Review), pp. 1–35 and 2 plates. Privately published for the authors by Southwest Offset, Silver City, New Mexico.

Roewer, C.F. 1934. Solifugae, Palpigradi. *In* H.G. Bronns (ed.), Klassen und Ordnungen des Tierreichs. 5: Arthropoda. IV: Arachnoidea, vol. 5(IV)(4)(4–5):481–723. Akademische Verlagsgesellschaft M.B.H.: Leipzig.

Vázquez, I. 1981. Solifugos de Mexico (Arachnida: Solifugae). Universitates, Nacional, Auto de Mexico, Faculitas de Ciencias, Mexico (D. F.), pp. 1–78. Bachelor of Science Thesis, unpublished.

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